Rulmeca model 800HD motorised pulley was installed at Westmoreland Coal mine on a cold day in December 2015. Thermal power plant is shown in background.

Mike Gawinski, Rulmeca Corp., USA, details a motorised pulley upgrade on an exposed conveyor drive at a Westmoreland Coal mine, which improved conveyor performance and increased uptime.

ON THE UPGRADE

Coal mines and thermal power plants have used Rulmeca motorised pulley conveyor belt drives for more than 60 years. From Kazakhstan to the US and Thailand, on every continent, mine and plant operators have learned that motorised pulley technology is reliable, safe and easy to install.

The Westmoreland Kemmerer Inc. coal mine in Kemmerer, Wyoming, US, is a 13 400 acre opencast mine complex, which currently produces coal in three active areas from 12 primary seams and splits. It opened in 1881 as the Twin Creek underground mine to work the Adaville Formation and opened the Elkol underground mine in 1950. The Sorensen opencast operations opened in 1963. The Kemmerer mine has a production capacity of 4.8 million tpy of 9800 Btu sub-bituminous coal.

The mine supplies approximately 2.8 million tpy of coal to a 700 MW thermal power plant, adjacent to the mine, via a 4200 ft long overland conveyor (Figure 2). Commissioned in

Figure 2. Westmoreland Kemmerer mine (left) and thermal power plant (right) are connected by 4200 ft long overland conveyor, which moves 2.8 million tpy of sub-bituminous coal.

Figure 3. Silo reclaim conveyor #130 transfers coal from three silos to an overland conveyor or a truck loader on a 54 in wide belt at 600 ft/min.

Figure 4. Model 800HD Rulmeca motorised pulley at 180 hp with face width of 61.02 in., belt speed of 600 ft/min. and full ceramic lagging was installed in one shift.

1963, that plant feeds a grid that serves customers in Utah, Wyoming and Idaho.

The Kemmerer mine also operates a loading facility three miles south of the overland conveyor transfer station, which supplies coal to other customers, including several trona mines and a sugar refinery approximately 60 miles east of the mine near Green River, Wyoming, via truck and rail. Rulmeca motorised pulleys have yielded satisfactory performance at these trona mines for more than seven years.

Operational challenge

Faced with an aging silo reclaim conveyor and 20 years of coal in reserve, the mine decided to improve plant efficiency and plan for the future by upgrading a problematic drive system on the 450 ft long 54 in. wide inclined #130 conveyor in 2015. Fed by three weigh belt feeders beneath three silos at a rate of 1600 tph, this convex conveyor feeds the overland conveyor, as well as a truck loader (Figure 3).

In 2015, the mine's #130 conveyor drive consisted of a 200 hp totally-enclosed fan-cooled (TEFC) AC squirrel-cage induction motor coupled to a pedestal-mounted right angle gear reducer, which was coupled to a live-shaft, lagged drive pulley with external pillow block bearings and mechanical backstop. Eventually, the exposed drive system became unreliable due to chronic coupling failures (requiring weekly re-welding) and occasional pulley slippage. Slippage was most prevalent during winter weather temperature, which can approach -30°F.

Unscheduled outages due to conveyor drive problems caused difficulties for operations personnel because the mine is expected to deliver coal to the power plant for 20 hr each day and 5.5 days each week.

In addition to improving conveyor reliability and performance, mine management had a strong desire to improve working conditions for plant personnel, while reducing the cost of maintenance as much as possible.

Quick Installation

Conveyors & Equipment of Salt Lake City, Utah, suggested that Kemmerer mine consider a Rulmeca motorised

pulley to replace the aging #130 conveyor drive in 2015. By December of that year, one 180 hp model 800HD Rulmeca motorised pulley was installed in the conveyor head position (Figure 1). The installation crew only required one shift to install the 5700 lb motorised pulley thanks to the pulleys' compact size, light weight and ease of alignment. Time-consuming drive component alignment was unnecessary because all drive components are internal and pre-aligned (Figure 4).

Kemmerer mine Maintenance Superintendent, Jerry Schinke, said: "The actual install of the Rulmeca motorised pulley was quick and painless. There was a noticeable drop in the noise level and I am looking forward to the heat from the pulley keeping the belt ice free."

The motorised pulleys, in general, increase system reliability, lower maintenance expense, improve personnel safety, save space and reduce power consumption because they enclose all drive components within an oil-filled and hermetically sealed pulley shell (Figure 5).

Onsite during the installation, Rulmeca Operations Manager, Jay Graham, said: "In spite of the bitter winter weather, the crew was able to position and connect the motorised pulley without complications. And I'm sure the product's ceramic lagging and internal heat will help its performance in cold conditions like that in the future."

The weight of the original drive system at the Kemmerer mine was nearly 50% more than the motorised pulley drive (Figure 6) because each motorised pulley encloses its motor and gearbox within the pulley shell, eliminating redundant parts. Motorised pulleys are lighter because exposed systems require motors and gearboxes to be protected within separate cast iron or steel enclosures. Furthermore, the internal drivetrain acts like a deep beam, resisting deflection in a light weight package.

Mine process improvement

Nearly one year of satisfactory performance by the motorised pulley on the #130 conveyor convinced Kemmerer mine personnel to consider switching other conveyor drives from exposed drives to motorised pulleys as budget and schedule permit. Conveyor upgrades in the train and truck loadout facility are currently under review.

Schinke said: "I am quite satisfied with the performance of the Rulmeca pulley. We have had no mechanical problems since its installation and expect many years of trouble-free service."

The Kemmerer mine left the original exposed motor and gearbox in place to

Figure 5. Motorised pulley hermetically seals motor and gearbox within oil-filled pulley shell.

Figure 6. Live shaft pulley and two pillow blocks (above) and exposed motor and gearbox (below) during removal from service. Weight of original drive system was nearly 50% more than motorised pulley drive.

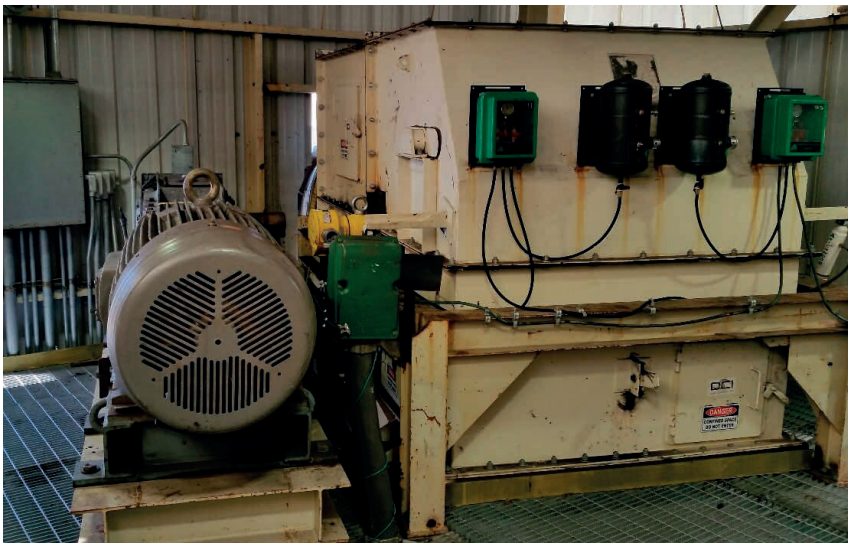

Figure 7. Original exposed drive motor and gearbox are still in place, serving as a back-up to the motorised pulley. When these items are removed, personnel access to the drive pulley will be enhanced.

Table 1. Annual exposed drive maintenance schedule – 100 hp
1. Make examinations
• Check alignment
• Check spider plate condition
• Check multidisc
• Check motor bearings
• Check guarding
Subtotal = 6 hr x 2 personnel x US$33/hr x 2 = US$792/yr
2. Change multidisc
Subtotal = US$459 x 2 = US$918
3. Do vibration analysis & report (monthly)
Subtotal = 2 hr/month x 12 x US$33/hr = US$792
4. Analyse oil samples & make report:
Subtotal = 2 hr/month x 12 x $33.00/hr = US$792
Total annual maintenance cost eliminated = US$3294

serve as back up to the motorised pulley drive system (Figure 7). Personnel access to the #130 conveyor drive will be improved when the drive system is eventually removed.

Although sound level testing was not performed at the Kemmerer mine, sound meter testing at a European coal mine revealed a 15 db reduction in noise after a comparable 100 hp motorised pulley replaced an exposed drive system.

That same mine measured a 7.8% efficiency improvement for one 100 hp motorised pulley, yielding electrical power savings of US$5900/yr, calculated as follows: US$0.115/kWh x 5.86 kWh x 8760 hr/yr = US$5900/yr.

The European coal mine also eliminated numerous maintenance tasks and nearly US$3500/yr when it replaced its old exposed drive system with a new 100 hp motorised pulley, as shown in Table 1.

Conclusion

The Kemmerer mine's adoption of motorised pulley technology is part of a local trend, which began in the trona mines in southwestern Wyoming several years ago in both surface and underground conveyors. The acceptance of motorised pulley technology throughout the US, across Europe, and in Asia began slowly in the 1980s but has accelerated in this century. WC

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